

What is claimed is:

1. A method comprising:  
contacting a hydrocarbon-containing solid substrate material with an extraction fluid at conditions whereat the extraction fluid has a reduced density of at least 0.2 and a reduced density of no more than 2.0 wherein at least a portion of the hydrocarbon contained in the solid material is extracted into the extraction fluid to form an inflation gas-producing mixture.
2. The method of claim 1 wherein the extraction fluid includes at least one extraction medium selected from the group consisting of nitrous oxide, carbon dioxide, SF<sub>6</sub>, xenon, ammonia and mixtures thereof.
3. The method of claim 1 wherein the substrate material comprises a polysiloxane.
4. The method of claim 1 wherein the extraction fluid comprises nitrous oxide.
5. The method of claim 4 wherein the extraction fluid additionally comprises carbon dioxide.

6. The method of claim 5 wherein the extraction fluid contains:  
at least 5 percent and no more than 90 percent nitrous oxide and at least  
10 percent and no more than 95 percent carbon dioxide.

7. The method of claim 6 wherein the extraction fluid contains:  
at least 15 percent and no more than 60 percent nitrous oxide and at least  
40 percent and no more than 85 percent carbon dioxide.

8. The method of claim 5 wherein the inflation gas-producing  
mixture has an equivalence ratio of less than 0.25.

9. The method of claim 5 wherein the inflation gas-producing  
mixture has an equivalence ratio of at least 0.25 and no more than 1.4.

10. The method of claim 9 wherein the inflation gas-producing  
mixture has an equivalence ratio of at least 0.4 and no more than 0.7.

11. The method of claim 1 wherein the extraction fluid comprises  
carbon dioxide.

12. The method of claim 11 wherein the extraction fluid additionally comprises at least 5 percent and no more than 50 percent molecular oxygen.

13. The method of claim 11 wherein the inflation gas-producing mixture has an equivalence ratio of at least 0.25 and no more than 1.4.

14. The method of claim 13 wherein the inflation gas-producing mixture has an equivalence ratio of at least 0.4 and no more than 0.7.

15. The method of claim 1 wherein the extracted hydrocarbon is selected from the group consisting of paraffins, olefins, cycloparaffins, alcohols, esters, ethers and mixtures thereof.

16. The method of claim 15 wherein the extracted hydrocarbon is ethylene.

17. The method of claim 1 wherein the extracted hydrocarbon forms a miscible combination with the extraction fluid.

18. The method of claim 1 further comprising:  
initiating reaction of the inflation gas-producing mixture to form an  
inflation gas.

19. The method of claim 18 wherein the substrate material is at least  
partially consumed in the reaction of the inflation gas-producing mixture.

20. The method of claim 1 wherein the substrate material additionally  
contains a quantity of Kr<sup>85</sup> and wherein the contacting step results in extraction from  
the substrate material of at least a leak detection quantity of Kr<sup>85</sup> by the extraction  
fluid.

21. A method for the in situ formation of an inflation gas-producing  
mixture, said method comprising:

contacting a hydrocarbon-containing substrate material with an  
extraction fluid containing at least one extraction medium selected from the group  
consisting of nitrous oxide, carbon dioxide, and mixtures thereof and at conditions  
whereat the extraction fluid has a reduced density of at least 0.2 and a reduced density  
of no more than 2.0 wherein at least a portion of the hydrocarbon contained in the  
solid material is extracted into the extraction fluid to form the inflation gas-producing  
mixture.

22. The method of claim 21 wherein the extraction fluid contains:  
at least 5 percent and no more than 90 percent nitrous oxide and at least  
10 percent and no more than 95 percent carbon dioxide.

23. The method of claim 22 wherein the extraction fluid contains:  
at least 15 percent and no more than 60 percent nitrous oxide and at least  
40 percent and no more than 85 percent carbon dioxide.

24. The method of claim 21 wherein the inflation gas-producing  
mixture has an equivalence ratio of less than 0.25.

25. An inflation gas-providing device wherein a mixture including  
a hydrocarbon material and an oxygen-containing material react to provide inflation  
gas, the gas-providing device comprising:

a chamber having contents including a hydrocarbon-containing solid  
substrate material and an extraction fluid at conditions whereat the extraction fluid has  
a reduced density of at least 0.2 and a reduced density of no more than 2.0 and  
wherein at least a portion of the hydrocarbon contained in the substrate material is  
extracted into the extraction fluid to form an inflation gas-producing mixture.

26. The device of claim 25 wherein the extraction fluid includes at least one extraction medium selected from the group consisting of nitrous oxide, carbon dioxide, SF<sub>6</sub>, xenon, ammonia and mixtures thereof.

27. The device of claim 25 wherein the substrate material comprises a polysiloxane.

28. The device of claim 25 wherein the extraction fluid comprises nitrous oxide.

29. The device of claim 28 wherein the extraction fluid additionally comprises carbon dioxide.

30. The device of claim 29 wherein the extraction fluid contains:  
at least 5 percent and no more than 90 percent nitrous oxide and at least 10 percent and no more than 95 percent carbon dioxide.

31. The device of claim 30 wherein the extraction fluid contains:  
at least 15 percent and no more than 60 percent nitrous oxide and at least 40 percent and no more than 85 percent carbon dioxide.

32. The device of claim 29 wherein the inflation gas-producing mixture has an equivalence ratio of less than 0.25.

33. The device of claim 29 wherein the inflation gas-producing mixture has an equivalence ratio of at least 0.25 and no more than 1.4.

34. The device of claim 33 wherein the inflation gas-producing mixture has an equivalence ratio of at least 0.4 and no more than 0.7.

35. The device of claim 25 wherein the extraction fluid comprises carbon dioxide.

36. The device of claim 35 wherein the extraction fluid additionally comprises at least 5 percent and no more than 50 percent molecular oxygen.

37. The device of claim 35 wherein the inflation gas-producing mixture has an equivalence ratio of at least 0.25 and no more than 1.4.

38. The device of claim 37 wherein the inflation gas-producing mixture has an equivalence ratio of at least 0.4 and no more than 0.7.

39. The device of claim 25 wherein the hydrocarbon-containing solid substrate material includes at least one hydrocarbon is selected from the group consisting of paraffins, olefins, cycloparaffins, alcohols, esters, ethers and mixtures thereof.

40. The device of claim 25 wherein the substrate material includes the hydrocarbon ethylene.

41. The device of claim 25 additionally comprising an initiator device which upon actuation initiates reaction of the inflation gas-producing mixture.

42. The device of claim 41 wherein the substrate material is at least partially consumable upon reaction of the inflation gas-producing mixture.

43. The device of claim 25 wherein the substrate material additionally contains a quantity of Kr<sup>85</sup> and wherein at least a leak detection quantity of Kr<sup>85</sup> is extracted into the inflation gas-producing mixture.